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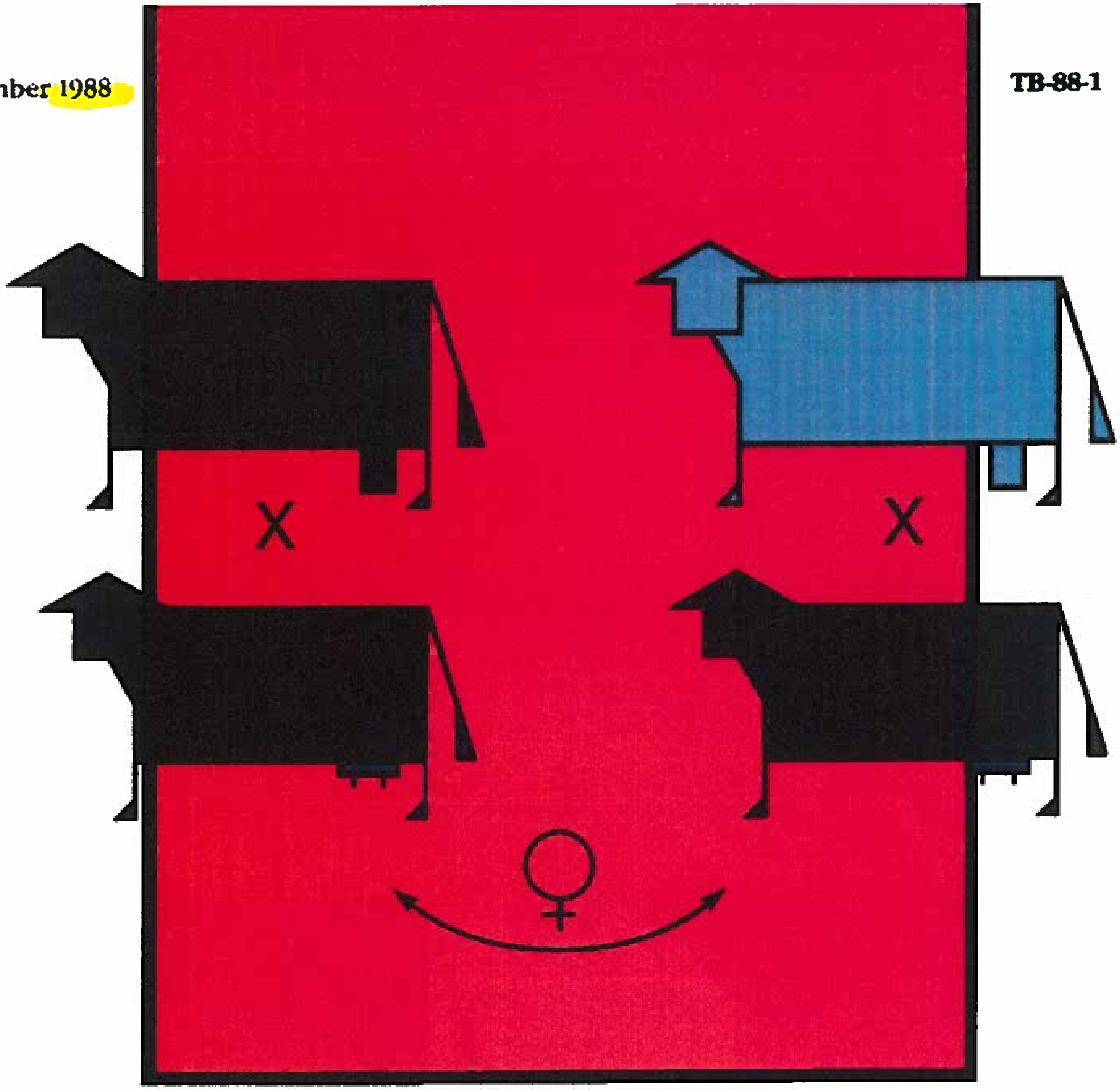

Crossbreeding Beef Cattle for Western Range Environments

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CROSSBREEDING BEEF CATTLE
FOR WESTERN RANGE ENVIRONMENTS

D.D. Kress and T.C. Nelsen

INTRODUCTION

The beef cattle industry has increasingly turned to crossbreeding as a tool for improving productivity through heterosis and for combining traits from different breeds to match cattle to varying environments and markets. Western ranges are substantially different from environments in other regions of the United States.

Beef cattle production will be at biological and economical optimums when cattle are matched to the environment. The environment includes not only the important elements of climate and terrain, but also the effects of parasites, disease and the overall level of management. The Western United States has, in general, a common problem of low rainfall and temperature extremes.

Variation in the environment over time must also be considered. High-performing cattle that require more care and a high quality and large quantity of feed will be hurt much more by drought, disease or neglect than will lower performing cattle with lower requirements. On the other hand, resources are wasted if cattle don't have the genetic potential to use abundant resources.

Member states and agencies of WRCC-1 (Western Regional Coordinating Committee for Beef Cattle Breeding) have produced a considerable body of data that compares various beef breeds and beef breed crosses for their productivity under Western range conditions. This publication summarizes those results to aid beef cattle breeders in implementing a sound crossbreeding program and in matching beef cattle to the Western range environment.

It is important that both commercial and purebred beef cattle breeders understand the advantages and disadvantages of using crossbreeding and different crossbreeding systems. Commercial breeders must evaluate crossbreeding results and understand the different crossbreeding systems before implementing a crossbreeding program for each unique operation. The same applies to the purebred breeder, who must be able to (1) give intelligent advice to commercial breeders that buy his seedstock; and, (2) know where his genetic product best fits into crossbreeding programs.

ADVANTAGES AND LIMITATIONS OF CROSSBREEDING

There are many reasons for the commercial beef breeder to crossbreed and few disadvantages if the crossbreeding program is based on sound information and a bit of common sense. A discussion of the advantages of crossbreeding follows:

1. **INDIVIDUAL HETEROSIS.** Heterosis or hybrid vigor is the degree to which crossbred calves deviate from the average of calves of the parental breeds. The amount and percentage of heterosis can be calculated as follows where straightbred Angus (A), straightbred Hereford (H), and crosses between Angus and Hereford (AH and HA) were raised as contemporaries:

$$\text{Amount of Heterosis} = \frac{AH + HA}{2} - \frac{A + H}{2}$$

$$\text{Percent of Heterosis} = \frac{\text{amount of heterosis}}{\frac{A + H}{2}} \times 100$$

As an example for weaning weight, if A = 400 lb, H = 450 lb, AH = 440 lb and HA = 450 lb, then

$$\text{Amount of Heterosis} = 445 \text{ lb} - 425 \text{ lb} = 20 \text{ lb}$$

$$\text{Percent of Heterosis} = \frac{20}{425} \times 100 = 5\%$$

Note that heterosis may be positive or negative and that there may be positive heterosis even when one of the parental breeds performs better than the average of crossbreds.

2. **MATERNAL HETEROSIS.** Maternal heterosis arises from using crossbred cows. A maternal heterosis value of 6 percent for calf weaning weight means that crossbred cows wean calves that weigh 6 percent more than if those same calves had been raised on straightbred cows. Maternal heterosis is usually greater than individual heterosis for maternally influenced traits and, as a result, crossbreeding programs should include use of a crossbred cow.

3. **COMPLEMENTARITY OF MALE AND FEMALE TRAITS.** Certain crossbreeding systems allow the breeder to match traits of the bull breed to traits of the crossbred cow. Normally this means that the breeder chooses a bull breed that will transmit rapid growth and desirable carcass traits to progeny while the crossbred cow provides ample milk for the rapidly growing calf and produces a live, healthy calf every year. Complementarity can work in a negative way in poorly designed crossbreeding programs where large, terminal sire breeds are bred to small, young, hard-calving cows. This can result in an excessive frequency of dystocia.

4. **"BUILDING" THE BEST MATCH OF CROSSBRED COW TO ENVIRONMENT.** This advantage has been overlooked by some breeders. But, in the West's many different range environments, this may be the most important consideration. There are many beef breeds available to the producer and some combination of these breeds should result in a desirable match of crossbred cow genotype to the particular range environment.

5. **EFFECTS OF CROSSBREEDING ACCUMULATE.** Crossbreeding may result in relatively small levels of heterosis (4 percent) for each trait, but these heterotic effects tend to accumulate so that there can be large increases (25 percent) in overall productivity!

6. **RAPID ADAPTATION TO CHANGING MARKET OR RESOURCES.** Terminal sire systems give the breeder an opportunity to change sires rapidly so that calves can be changed according to market demands or resources.

Crossbreeding will not compensate for poor management. Crossbreeding systems that utilize two or more breeds of sires (for example, the rotation systems) may cause increased variability of calves and lead to marketing or management problems. Some crossbreeding systems require several breeding pastures and some require that cows be identified by year of birth and breed of sire.

SUMMARY OF BEEF CATTLE CROSSBREEDING RESULTS IN THE WESTERN REGION

For the commercial breeder to use crossbreeding effectively, the breeder must understand the biological differences among breeds and know the level of heterosis to expect for various traits. Summaries of research results on these two issues are presented in the following Tables:

Table 1 lists various beef breeds and groups them according to biological type based on: (1) level of milk production; (2) growth rate and mature size; (3) percentage retail product; and, (4) age at puberty. This is not an exhaustive list of characteristics that could be used to classify cattle, but from a practical standpoint it does a good job of classifying breeds into different biological types.

It is important to match the biological type of the cow to the environment of the beef operation. Table 1 can be very helpful during this process. For example, if the environment is characterized by high annual precipitation, good quantity and quality summer forage, and plentiful winter feed, then the proper biological type of cow to match that environment would be a high milking, fast growth rate type of cow with early age at puberty. However, if the environment is more limiting, as in most low rainfall areas, then the proper biological type of cow would be one with lower milk production, a slower growth rate and an early age at puberty. Intermediate types of environments would dictate intermediate biological types of cows. Low quality and quantity summer range would dictate biological types of cows with lower milk production. Low quality and quantity winter feed would dictate smaller mature size. All biological types considered for the cow side of the herd should have average or earlier age at puberty. Therefore, the proper biological type of cow may be an Angus x Hereford cross in one environment and a Simmental x Tarentaise cross in another environment.

The primary characteristics to be desired, in regards to terminal sire breeds, are rapid growth rate and a high percentage of retail product.

It is also important for the producer to know the level of heterosis to expect from crossbreeding beef cattle. Table 2 lists individual traits and the average percentages of individual, maternal and total (sum of individual and maternal) heterosis that have been reported in research publications. Since some traits are influenced by both the calf and the cow, both individual and maternal heterosis influence the trait. The total heterosis that can be achieved in a crossbreeding system is the sum of the two.

TABLE 1. BREEDS GROUPED BY BIOLOGICAL TYPE[a]

Breed	Milk Production	Growth Rate and Mature Size	Percentage Retail Product	Age at Puberty
Red Poll	***	*	*	**
Jersey	*****	*	*	*
Devon	*	*	**	***
Hereford	**	**	*	***
Angus	***	**	*	**
Santa Gertrudis	***	****	*	**
Brangus	**	**	*	****
Brahman	***	***	***	*****
Tarentaise	****	***	****	**
Pinzgauer	****	***	***	*
Brown Swiss	****	***	***	*
Simmental	****	*****	*****	**
Gelbvieh	****	****	****	*
Holstein	*****	****	****	**
Maine Anjou	**	*****	****	**
South Devon	**	****	**	**
Limousin	*	***	*****	****
Charolais	**	*****	*****	****
Chianina	**	*****	*****	****

[a]Increasing number of *'s indicate greater values for the traits. For example, ***** = greatest milk production or oldest age at puberty and ** = below average percent retail product and relatively early age at puberty. Based in part on a cluster analysis of breed group means presented by Dr. L.V. Cundiff at the Third World Congress on Genetics Applied to Livestock Production.

TABLE 2. AVERAGE LEVELS OF INDIVIDUAL HETEROSIS AND MATERNAL HETEROSIS FOR TRAITS OF BEEF CATTLE.

Trait	Individual heterosis, %	Maternal heterosis, %	Total heterosis, %
Gestation length	0	0	0
Calving rate	0	6	6
Weaning rate	0	8	8
Female age at puberty	-3		-3
% reaching puberty by 15 mo	15		15
Survival birth	2	-1	1
Survival weaning	3	1	4
Calving difficulty	2	0	2
Birth weight	4	2	6
Weaning weight	5	6	11
Yearling weight	4		4
Cow mature weight	1		1
Cow mature height	1		1
Cow condition	-4		-4
Carcass weight	3		3
Dressing %	0		0
USDA carcass grade	2		2
Loin eye area	2		2
Fat thickness	6		6
% fat trim	6		6
Kidney fat	5		5
Carcass yield grade	5		5
% cutability	0		0
Feed conversion (TDN/gain)	-2		-2
Days on feed	-4		-4
Tenderness	0		0
Palatability	0		0
Trimmed retail cuts	3		3
Cow milk production			9
Calf wn. wt./cow exposed			18
Cow efficiency			2
Cow-calf TDN consumed			3
Calf wn. wt./cow wt.			8
Cow longevity			38
Cow lifetime productivity			25

Careful study of Table 2 reveals the following interesting results: (1) the level of heterosis varies from zero to very high, depending upon the trait and therefore, the producer should not expect crossbreeding to result in heterosis for dressing percentage, but should expect substantial gain in calf weaning weight per cow exposed to breeding; (2) maternal heterosis is very important for some traits, thus requiring a crossbred cow; (3) heterosis tends to accumulate so traits that are made up of several traits (like cow lifetime productivity) exhibit the greatest overall heterosis; and (4) heterosis is extremely important to the commercial breeder because increased productivity from heterosis can easily pay for any additional costs of crossbreeding!

Table 3 is provided as a means of summarizing the results on levels of heterosis for different categories of traits. It is relatively easy to remember that heterosis is low for carcass measurements but high for maternal ability.

Characteristics of cattle can be changed rapidly through crossbreeding, but producers must be aware that biggest is not always best, especially in the West. Producers should be aiming for optimums rather than maximums for most traits. The optimum biological type can change as environments are changed. For example, in Havre, Montana, the Simmental x Hereford cows outperformed the Angus x Hereford cows. At Miles City, Montana, in a lower and drier environment, the Angus x Hereford cows outperformed the Simmental x Hereford cows. Brahman x Hereford crosses generally do better than Angus x Hereford crosses along the Gulf Coast of the Unites States but in the higher, drier and colder plateaus of Nevada, the Brahman x Hereford calves have problems with survival.

All in all, crossbreeding can be beneficial for most commercial beef producers in the West. However, like any other breeding plan, crossbreeding works best when it has been well thought out before it is started.

CROSSBREEDING SYSTEMS

Traditional crossbreeding systems usually require several breeding pastures (or artificial insemination). For many commercial breeders, the use of several breeding pastures is not economically feasible, so the traditional crossbreeding systems will not be practical.

Several possible crossbreeding systems are described in the following section. No single system is best for all producers. In fact, the best system for a particular producer might be a combination of two or more systems. The first systems are traditional ones, the next are simplified or "effective" systems that generally require only one breeding pasture, and the last are combinations of systems. Various breeds have been used for illustrative purposes. Their symbols are: A = Angus, C = Charolais, G = Gelbvieh, H = Hereford, L = Limousin, P = Pinzgauer, R = Red Poll, Sa = Salers, Sh = Shorthorn, Si = Simmental and T = Tarentaise. Notes on each system regarding the number of breeding pastures required, replacement females, etc., are listed at the bottom of each diagram. Producers should study these systems and decide which one would work best in their operation. It is important for producers to use a <u>planned</u> system even if it is a simple one.

TABLE 3. SUMMARY OF TOTAL HETEROSIS BY TYPE OF TRAIT

Trait	Total heterosis
Carcass measurements Skeletal measurements Mature weight	Low (0 to 5%)
Growth rate Early weights Milk production	Med (5 to 10%)
Maternal ability Reproduction Health Cow longevity Overall productivity	High (10 to 30%)

Table 4 serves as a basis for comparing expected cow productivity from the different systems. The measure of productivity is amount of calf weaned per cow exposed to breeding. The advantage refers to the increased productivity from the particular system relative to what would be achieved using straightbreds. For example, suppose that a straightbred Angus averaged 400 lb and Herefords averaged 350 lb for amount of calf weaned per cow exposed. The 2-breed rotation of Angus and Hereford is expected to increase productivity by 16 percent over 375 lb (average of Angus and Hereford) or to a level of 435 lb (375 lb + .16 times 375 lb = 375 lb + 60 lb).

No single crossbreeding system will be best for all situations, but a planned system should be used. Simple systems may sacrifice heterosis and/or complementarity, but may be just right for an operation.

Producers should remember to be innovative!

Table 4. COMPARISON OF CROSSBREEDING SYSTEMS BY TYPE OF SYSTEM[1]

Type of system	Advantage (%)[2]	Page illustrated
Traditional Crossbreeding Systems		
Rotation		
2 - breed	16	14
3 - breed	20	15
4 - breed	22	
Static terminal sire (3-breed)	20	16
Static terminal sire (2-breed)	9	
Rotational terminal sire		
2 - breed	21	17
3 - breed	24	
Effective or Simplified Crossbreeding Systems		
Rotate sire breed		
2 - breed	12	
3 - breed	16	19
2 - breed rotation with F_1 sires	19	
Multiple sire breed with crossbred females		
2 - breed	10	20
3 - breed	15	
Multiple sire breed with straightbred females		
2 - breed	7	21
3 - breed	7	
Composite[3]		
2 - breed	13	
3 - breed	15	
4 - breed	17	22
8 - breed	20	
Static terminal sire		
- buy straightbred females	24	23
- buy crossbred F_1 females	28	24
- buy composite or rotational	20 to 27	25
Combinations of Crossbreeding Systems		
2 - breed rotation and rotate sire breed (2)	19	27
2 - breed rotation and multiple sire breed (2)	20	28
Rotate sire breed (2) and multiple sire breed (2)	19	29
Static terminal sire with crossbred male	20 to 25	30
Rotate sire breed (3) with terminal sire	24	

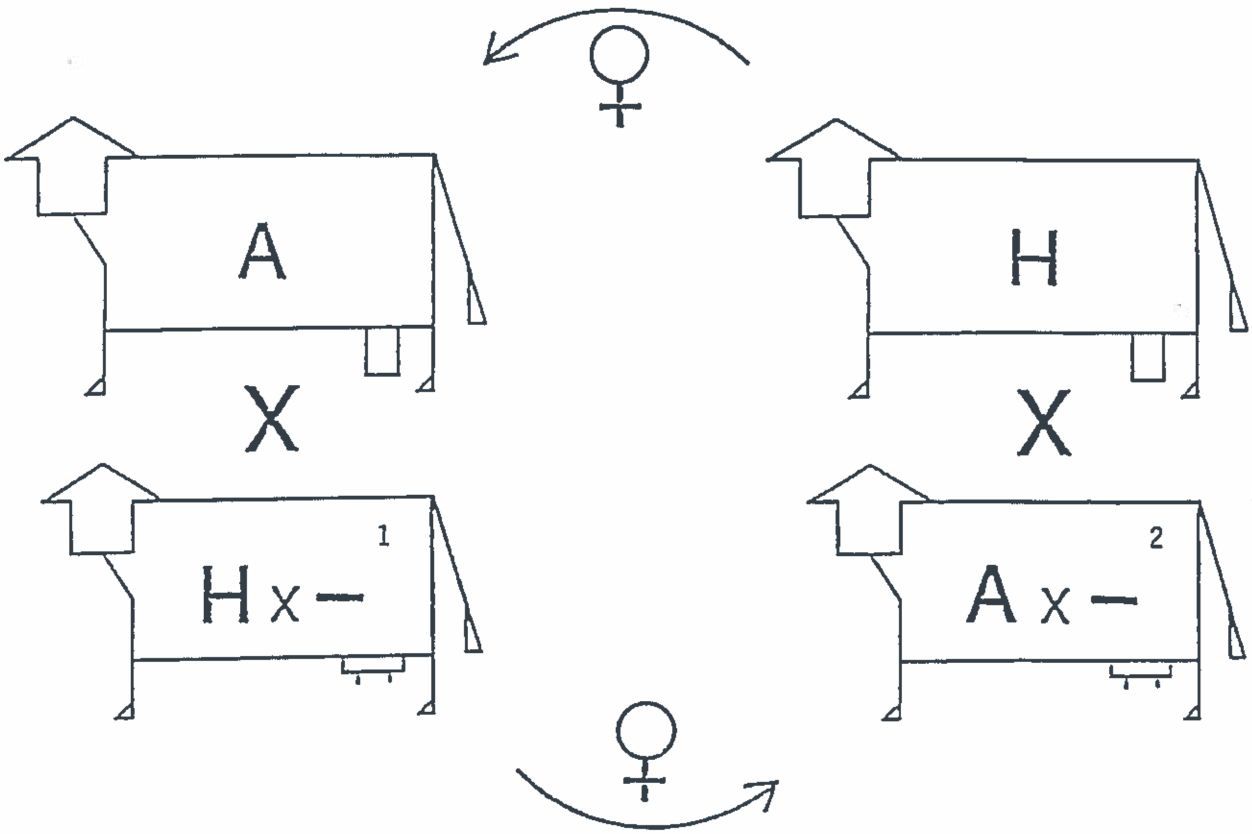
[1]After Gregory and Cundiff (1980), Baker (1982), Kress (1985) and others.

[2]Percentage advantage for pounds of calf weaned per cow exposed when compared to the average of the breeds involved in the crossbreeding system. Assumes 80% calf crop weaned, 20% replacement rate, individual heterosis = 8.5%, maternal heterosis = 14.8% and 5% increase in calf weight due to terminal sire. Also assumes that cow breed type has been adequately matched to environment and sire genotype and that proper advantage has been taken of complementarity of sire genotype and dam genotype in terminal sire systems.

[3]Breeds in equal or nearly equal proportion.

TRADITIONAL CROSSBREEDING SYSTEMS

2-BREED ROTATION



1. Requires two breeding pastures or AI.
2. Utilizes individual and maternal heterosis (67% of maximum).
3. Allows limited use of complementarity.
4. Replacement females produced within the system and need to be identified by breed of sire.
5. Genetic improvement determined primarily by genetic potential of A and H sires.
6. Breeds should be similar for size and milk production.
7. Expected to increase calf production per cow exposed by 16%.

Beginning with a foundation herd of Hereford cows, breed all cows to Angus bulls. The Angus x Hereford daughters are saved for replacements and mated to Hereford bulls. The H x (AH) replacements are moved to the herd mated with Angus bulls. This continues such that daughters born in the A sire herd are bred in the H sire herd and vice versa. In any one year there are two breeding pastures with Angus bulls in one and Hereford bulls in the other.

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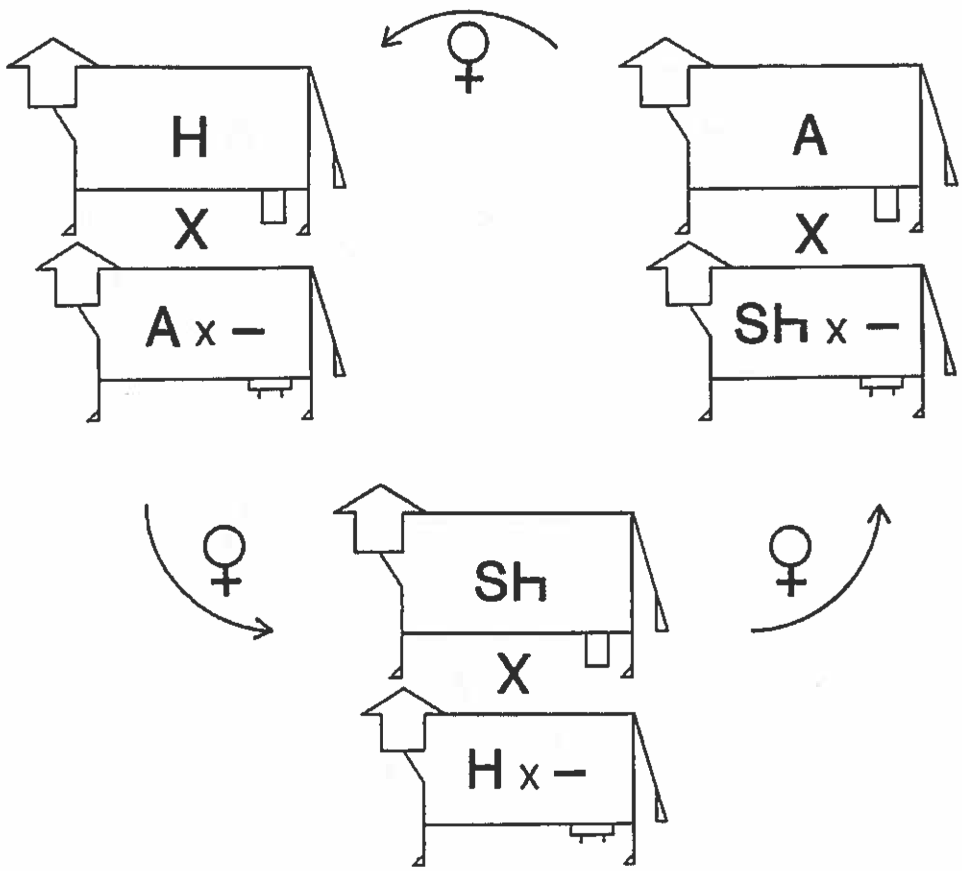
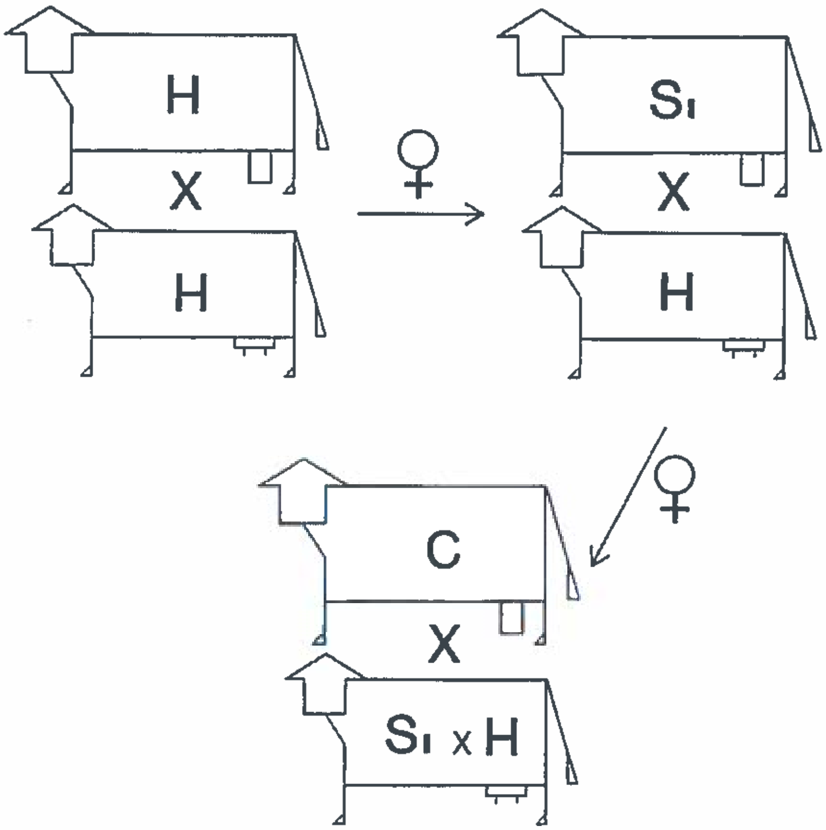
[1]Denotes an H-sired female.
[2]Denotes an A-sired female.

3-BREED ROTATION



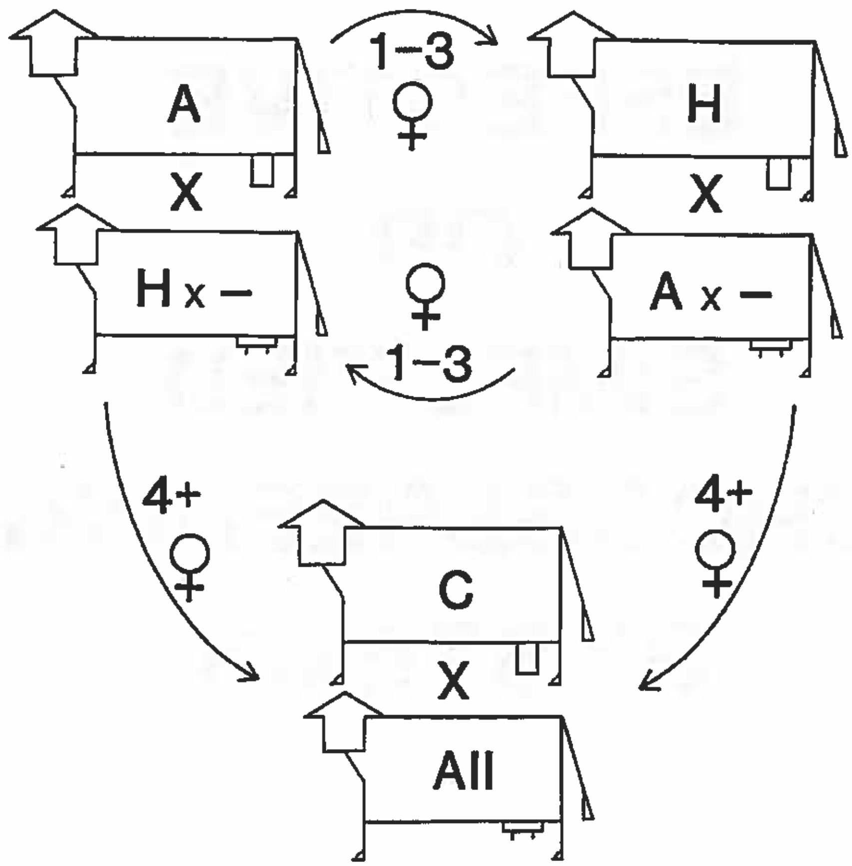
1. Requires three breeding pastures or AI.
2. Utilizes individual and maternal heterosis (86% of maximum).
3. Allows limited use of complementarity.
4. Replacement females produced within the system and need to be identified by breed of sire.
5. Genetic improvement determined primarily by genetic potential of H, A and Sh sires.
6. Breeds should be similar for size and milk production.
7. Each crossbred cow should be mated to the breed of sire to which she is most distantly related.
8. Expected to increase calf productivity per cow exposed by 20%.

STATIC TERMINAL SIRE



1. Requires three breeding pastures or AI.
2. Approximately 25% of females in H x H matings, 30% of females in Si x H matings and 45% of females in terminal sire matings.
3. Individual heterosis in 75% of system and maternal heterosis in 45% of system.
4. Maximizes complementarity in 45% of herd.
5. Roughly 60% of progeny marketed are from terminal sire breed.
6. AI and sexed semen would make this system more efficient.
7. Genetic improvement determined primarily by genetic potential of H, Si and C sires.
8. Expected to increase calf production per cow exposed by 20%.

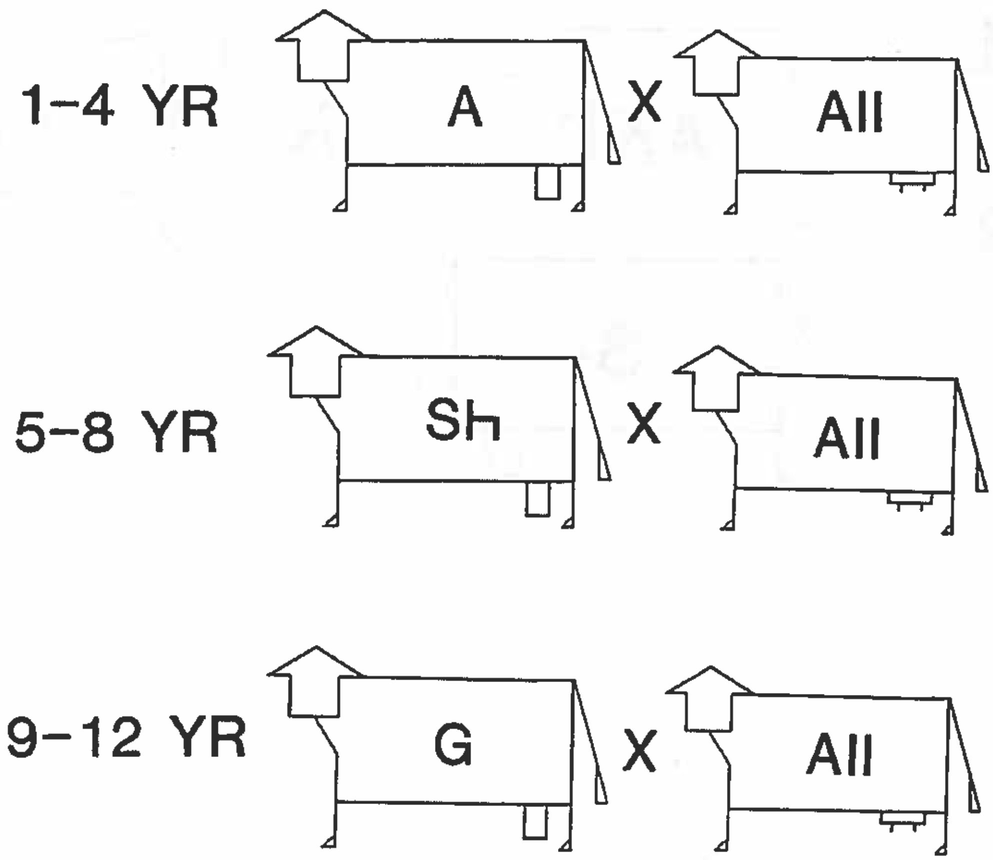
ROTATIONAL-TERMINAL SIRE



1. Requires three breeding pastures or AI.
2. Approximately 45% of females in rotation and 55% of females in terminal portion of system.
3. Utilizes individual and maternal heterosis.
4. Maximizes complementarity in 55% of herd.
5. Roughly 70% of progeny marketed are from terminal sire breed.
6. AI and sexed semen would make this system more efficient.
7. Genetic improvement determined primarily by genetic potential of A, H and C sires.
8. 1- to 3-year-old females are bred in the rotational part of the system and 4-year-old and older cows are bred in the terminal part of the system.
9. Expected to increase calf production per cow exposed by 21% for 2-breed rotation and 24% for 3-breed rotation.

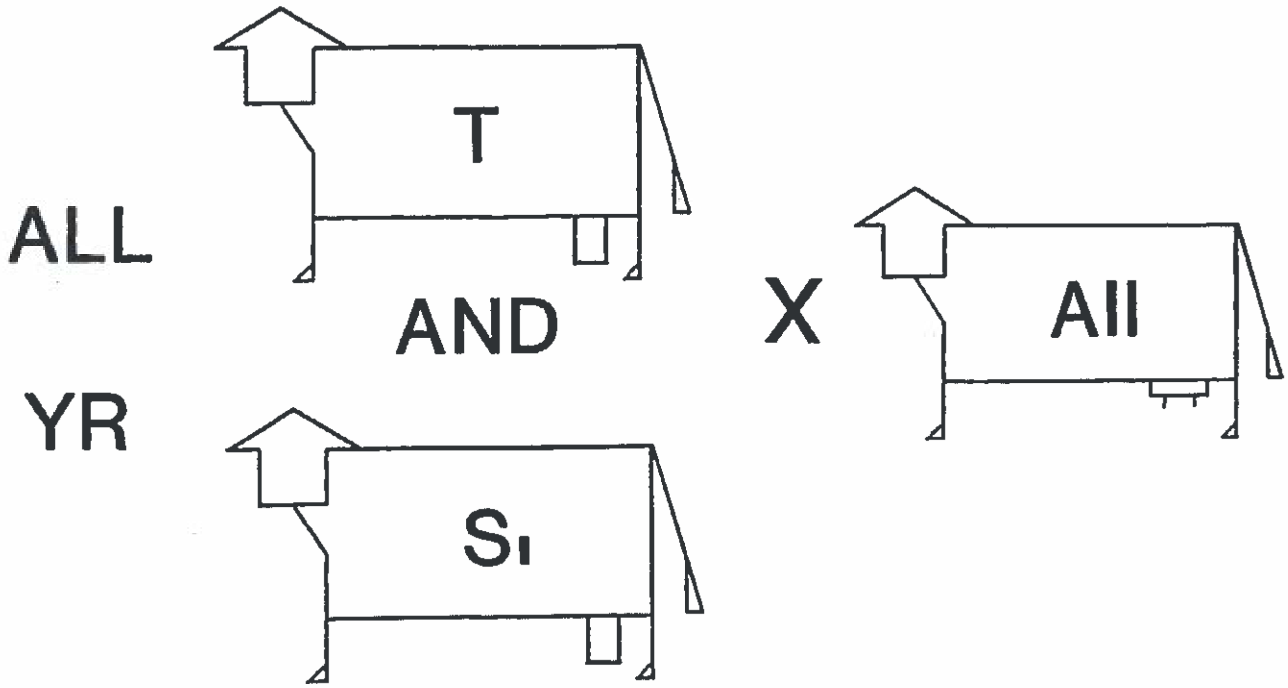
EFFECTIVE OR SIMPLIFIED CROSSBREEDING SYSTEMS

ROTATE SIRE BREED



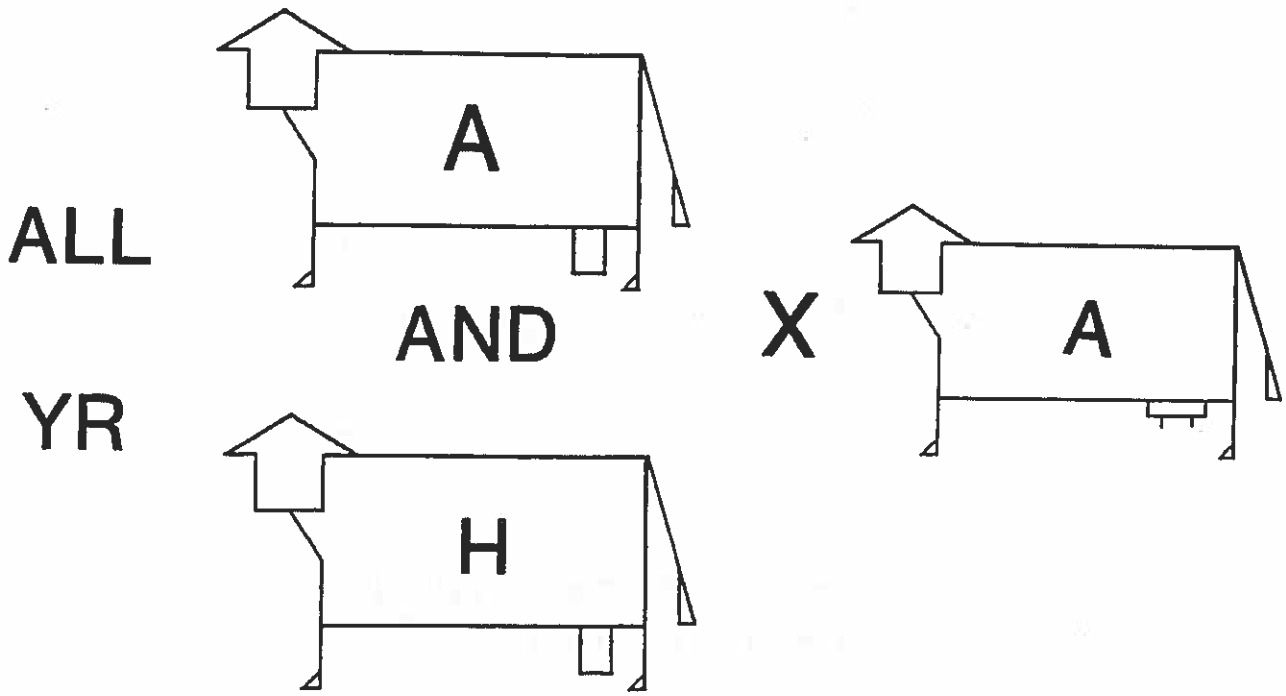
1. Requires one breeding pasture.
2. Start with available and adapted female breed (H for example).
3. Utilizes individual and maternal heterosis.
4. Allows limited use of complementarity.
5. Replacement females from within the system and do not need to identify cows by breed of sire.
6. Genetic improvement determined primarily by genetic potential of A, Sh and G sires.
7. Each sire breed could be used two to four years.
8. This system can be considered an approximation to a 3-breed rotation.
9. Expected to increase calf production per cow exposed by 16%.

MULTIPLE SIRE BREED WITH CROSSBRED FEMALES

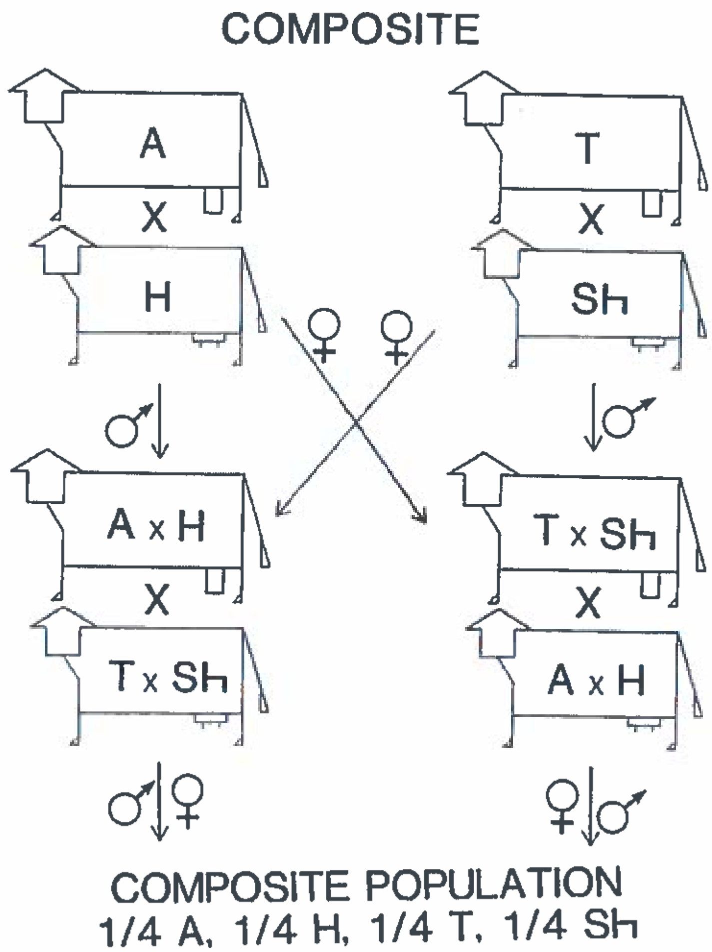


1. Requires one breeding pasture.
2. Utilizes individual and maternal heterosis.
3. Allows limited use of complementarity.
4. Replacement females are crossbreds from within the system and do not need to be identified by breed of sire.
5. Genetic improvement determined primarily by genetic potential of T and Si sires.
6. This system can be considered an approximation to a composite.
7. Expected to increase calf production per cow exposed by 10%.

MULTIPLE SIRE BREED WITH STRAIGHTBRED FEMALES

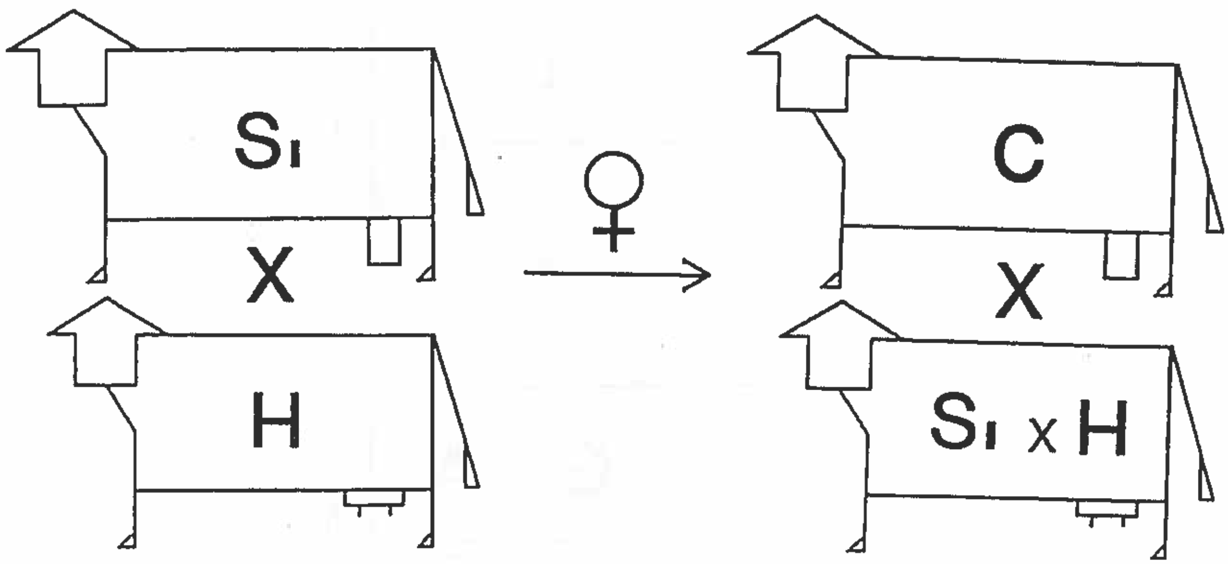


1. Requires one breeding pasture.
2. Utilizes individual heterosis.
3. Allows some use of complementarity.
4. Replacement females are straightbreds from within the system and do need to be identified by breed of sire.
5. Genetic improvement determined primarily by genetic potential of A sires.
6. Would have approximately 1/2 A and 1/2 H bulls.
7. All crossbred progeny are marketed.
8. Expected to increase calf production per cow exposed by 7%.



1. Requires one breeding pasture after composite development.
2. Utilizes individual and maternal heterosis.
3. Allows limited use of complementarity.
4. Replacement females and bulls from within the system and do not need to be identified by breed of sire.
5. Genetic improvement determined primarily by genetic potential of selected sires in composite.
6. Expected to increase calf production per cow exposed by 17%.

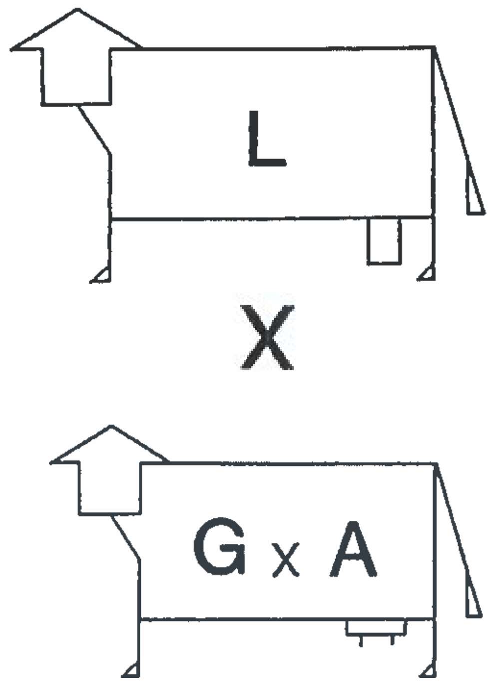
STATIC TERMINAL SIRE
BUY STRAIGHTBRED FEMALES



1. Requires two breeding pastures or AI.
2. Utilizes individual and maternal heterosis.
3. Maximizes complementarity in 55% of herd.
4. Straightbred replacement females are purchased--possible problems of availability and disease.
5. Genetic improvement determined primarily by genetic potential of Si and C sires and genetic potential of purchased H females.
6. Expected to increase calf production per cow exposed by 24%.

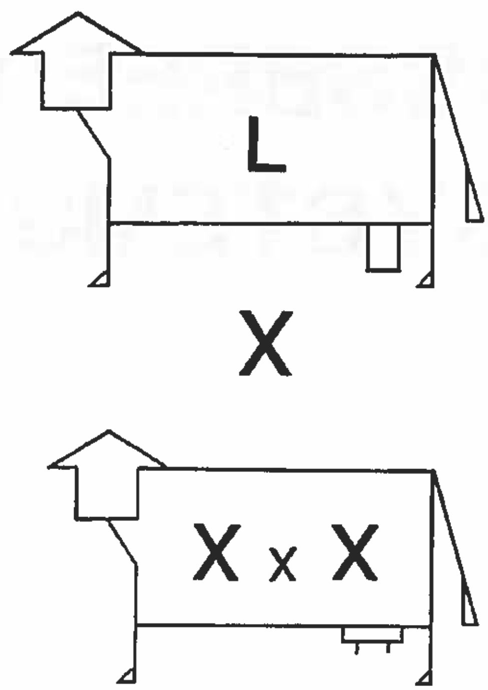
STATIC TERMINAL SIRE

BUY CROSSBRED F_1 FEMALES



1. Requires one breeding pasture.
2. Utilizes maximum individual and maternal heterosis.
3. Maximizes complementarity.
4. Replacement females are purchased--possible problems of availability and disease.
5. Genetic improvement determined by genetic potential of L sires and genetic potential of purchased G x A females.
6. Expected to increase calf production per cow exposed by 28%.

STATIC TERMINAL SIRE
BUY COMPOSITE OR ROTATIONAL CROSS FEMALES



1. Requires one breeding pasture.
2. Utilizes individual and maternal heterosis.
3. Maximizes complementarity.
4. Replacement females are purchased--possible problems of availability and disease.
5. Genetic improvement determined by genetic potential of L sires and genetic potential of purchased composite or rotational cross females.
6. Expected to increase calf production per cow exposed by 20 to 27% depending on the level of heterozygosity in the purchased females.

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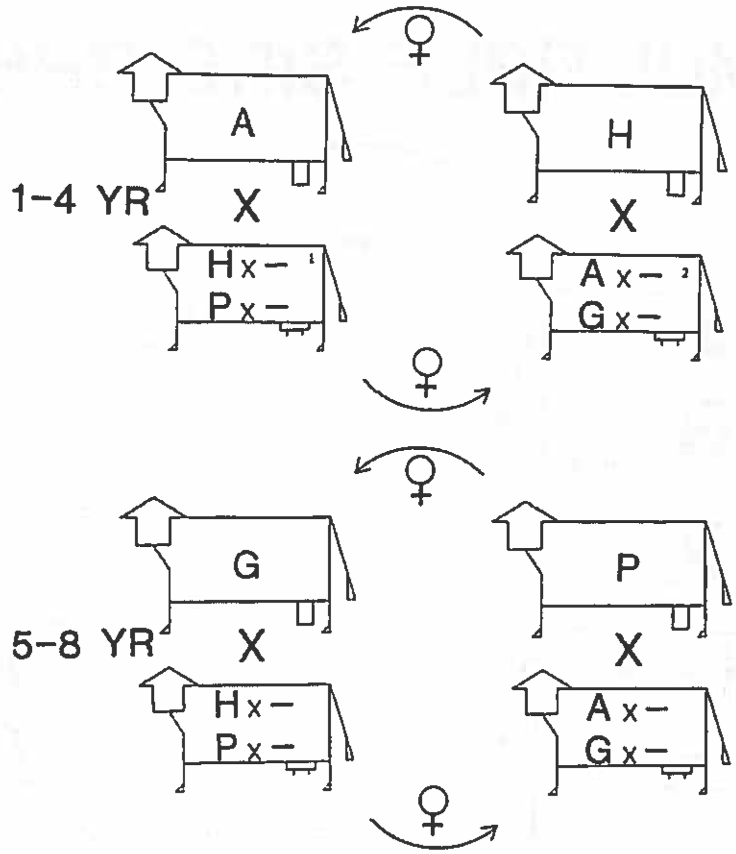
[1]Denotes composite or rotational cross females.

COMBINATIONS OF CROSSBREEDING SYSTEMS

2-BREED ROTATION AND ROTATE SIRE BREED



1. Requires two breeding pastures or AI.
2. Utilizes individual and maternal heterosis.
3. Allows limited use of complementarity.
4. Replacement females produced within the system and need to be identified by breed of sire (or by breeding pasture).
5. Need to use four breeds of sires that are of comparable size.
6. During the first four years, A and H sire breeds are used. During the second four years, G and P sire breeds are used.
7. Genetic improvement determined primarily by genetic potential of A, H, G and P sires.
8. Expected to increase calf production per cow exposed by 19%.

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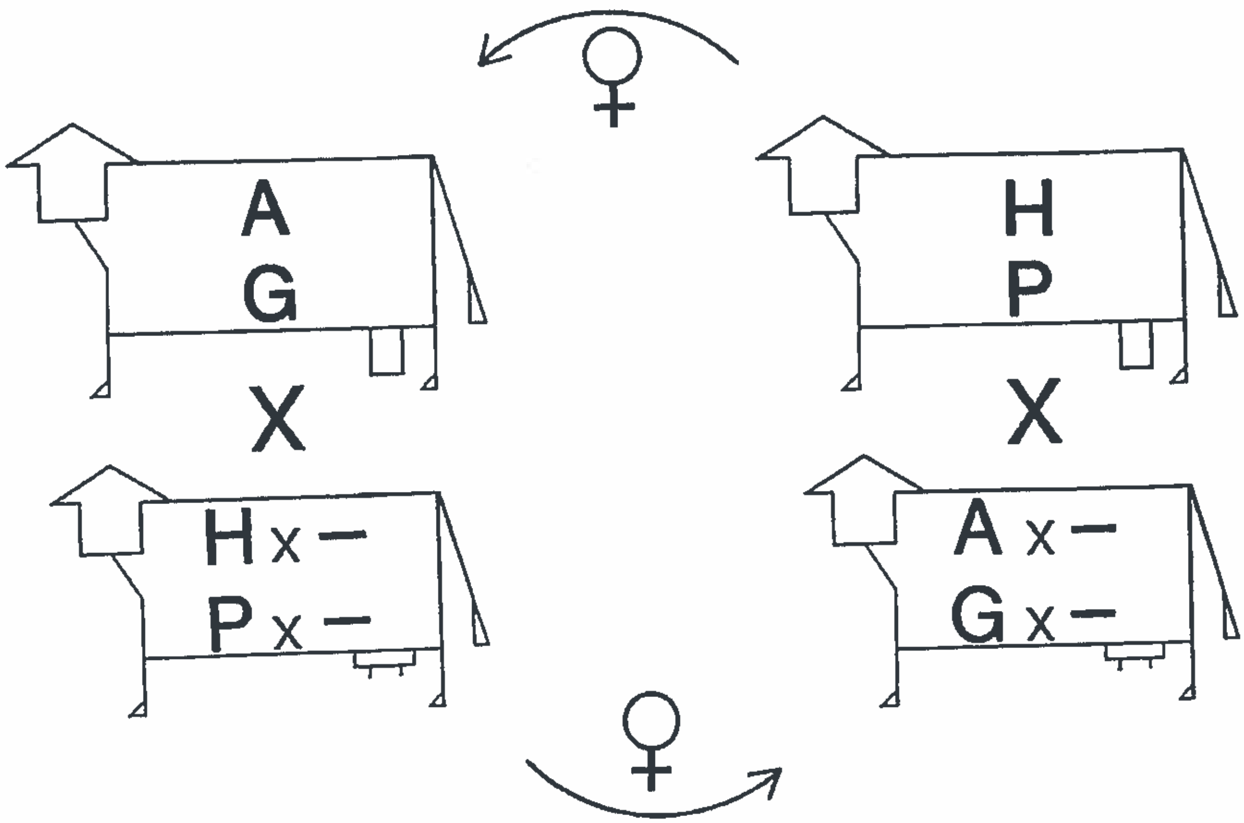
[1]Denotes females sired by H or P sires.

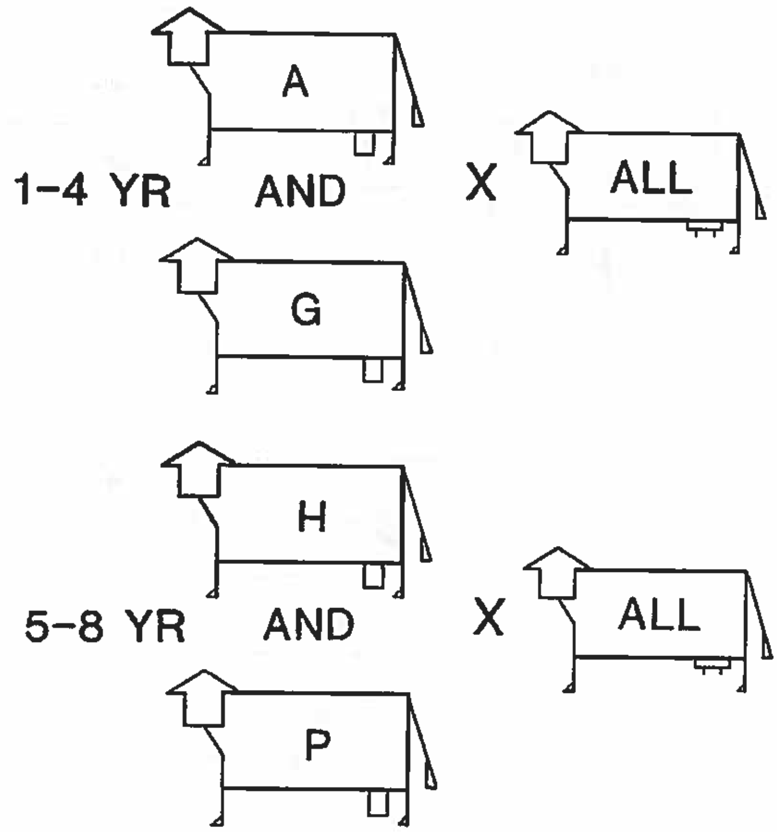
[2]Denotes females sired by A or G sires.

2-BREED ROTATION AND MULTIPLE SIRE BREED



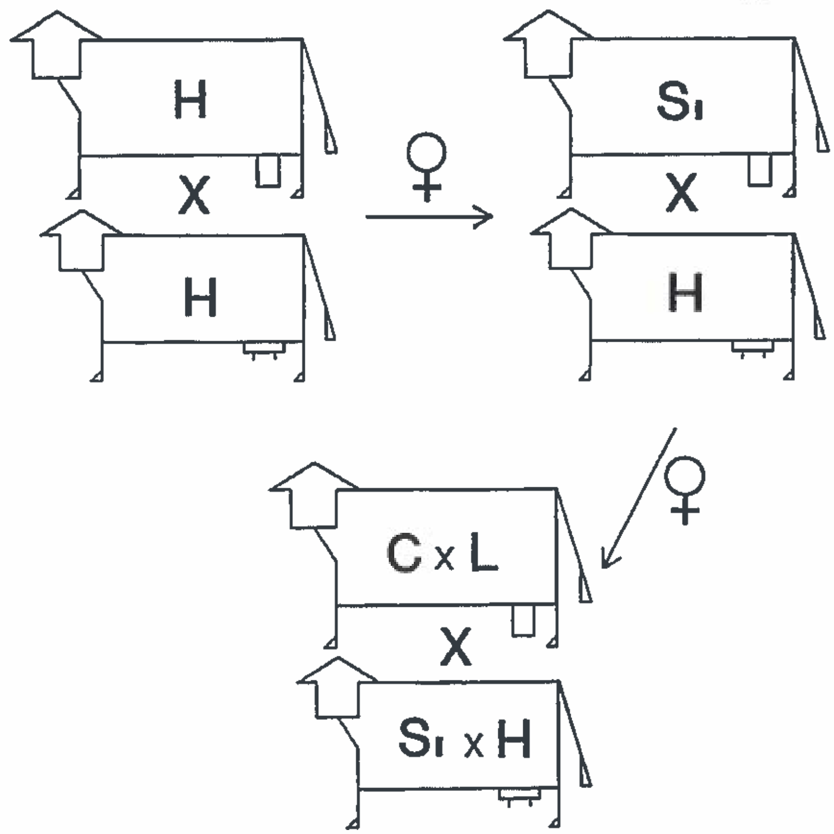
1. Requires two breeding pastures or AI.
2. Utilizes individual and maternal heterosis.
3. Allows limited use of complementarity.
4. Replacement females produced within the system and need to be identified by breed of sire (or by breeding pasture).
5. Use two breeds of sires in each breeding pasture.
6. Need to use four breeds of sires that are compatible.
7. Genetic improvement determined primarily by genetic potential of A, G. H and P sires.
8. As an alternative, F_1 sires (A x G and H x R) could be used in the two breeding pastures and achieve the same increase in productivity.
9. Expected to increase calf production per cow exposed by 20%.

ROTATE SIRE BREED AND MULTIPLE SIRE BREED



1. Requires one breeding pasture.
2. Utilizes individual and maternal heterosis.
3. Allows limited use of complementarity.
4. Replacement females are crossbreds from within the system and do not need to be identified by breed of sire.
5. Combines positive aspects of both systems.
6. Need to use four breeds of males that are compatible.
7. Use sire breeds A and G for four years and sire breeds H and P for four years.
8. Genetic improvement determined primarily by genetic potential of A, G, H and P sires.
9. Expected to increase calf production per cow exposed by 19%.

STATIC TERMINAL SIRE WITH CROSSBRED MALE



1. Requires three breeding pastures or AI.
2. Approximately 25% of females in H x H matings, 30% of females in Si x H matings and 45% of females in terminal sire matings.
3. Individual heterosis in 75% of system and maternal heterosis in 45% of system.
4. Maximize complementarity in 45% of herd.
5. Roughly 60% of progeny marketed are from terminal sire breed.
6. AI and sexed semen would make this system more efficient.
7. Genetic improvement determined primarily by genetic potential of H, Si and C x L sires.
8. Any advantage of this system over the static terminal sire system depends on any advantage of the crossbred male.
9. Expected to increase calf production per cow exposed by 20 to 25%.

APPLICATION OF RESULTS AND SYSTEMS

The previous sections have illustrated the advantages that can be gained when beef cattle breeders utilize crossbreeding. Individual heterosis has been shown to be important for traits like preweaning growth. However, a tremendous advantage can be reaped by the beef cattle breeder who uses crossbred cows that are well adapted (matched) to the breeder's environment. A breeder has some options in changing the environment, but many options in changing the cattle.

Crossbreeding is beneficial, but the benefits can be reduced by poor planning. So, breeders should remember (1) to pick breeds carefully so there is a good match of genotype to management and environment; (2) to select sires and female replacements wisely so the crossbreeding system is powered by superior genetics; (3) not to regard crossbreeding as a substitute for poor management; and, (4) to choose sire breeds carefully in terminal sire systems to maximize positive complementarity and control negative complementarity (e.g., calving difficulty).

Implementation of a crossbreeding system proceeds in the following way: (1) A breeder starts by evaluating the environment and resources available to the operation. Most breeders can do this accurately, but occasionally a breeder is rather optimistic in appraising the type of cattle a given environment will support; (2) The level of management is matched to the environment. The level of management includes the number of breeding pastures, whether or not AI will be practiced and the degree to which the breeder will use management to modify the environment; (3) The crossbreeding system is matched to the level of management and environment; (4) The type of crossbred female is matched to the crossbreeding system, management and environment; and (5) The sire genotype (if not already decided by steps 3 and 4 above) is matched to the dam type, crossbreeding system, management and environment.

SUMMARY

The Western United States has beef cattle range environments that make the region unique. Crossbreeding has several possible advantages for this region. Results from beef cattle experiments in the Western region have shown that crossbreds are superior to straightbreds for many traits and that important levels of heterosis occur. It is important that the biological type of the cow is well adapted to the environment and resources of the operation.

Breeders should utilize a planned crossbreeding system to take advantage of heterosis. Even if a breeder has only one breeding pasture, there are several effective or simplified systems that can be used. The choice of the appropriate system, type of crossbred cow and sire breed must be based on sound research information and a dose of common sense.